REMARKS AND ARGUMENTS

The present Further Amendment and Response is directed to the subject matter of claims 14-27, which were examined and rejected in a 9 March 2007 Office Action. The within Further Amendment and Response first attempts to clear-up the confusion in the numbering and status of claims by canceling claims 1-72, and by presenting new claims 73-86, which respectively track claims 14-27, which were the subject of the 9 March 2007 Office Action.

Using the new claim numbers, claims 73, 75-79, and 83-86 were rejected under 35 USC §102(e) as being anticipated by USP 6,611,252 to DuFaux. Claims 74, 80, and 81 were rejected under 35 USC §103(a) as anticipated by DuFaux '252 in view of USP 6,281,878 to Montellese.

Applicants have canceled all claims 1-72, and have added new claims 73-86, where claim 73 contains language to more clearly distinguish from the art of record. (Applicants have also corrected a typographical error in canceled claim 25 in which "first operating system" and "second operating system" should have read "first optical system" and "second optical system". New claim 85 presents the correct nomenclature.

Claims 73-86 are pending.

REJECTIONS UNDER 35 USC §102(b):

At ¶1 of the Office Action, claims 73, 75-79, and 83-86 were rejected under 35 USC §102(b) as being anticipated by USP 6,611,252 to DuFaux. As applicants will now demonstrate, there are substantial differences between the presently claimed invention and what is described in DuFaux '252.

At para. [0004] in the Background of the Invention in the present Specification, applicants noted the problems associated with relying upon luminance data to

implement a virtual device. As noted therein, "unfortunately luminance data can confuse an imaging system. For example, a user's finger in the image foreground may be indistinguishable from regions of the background". Assume that a typist using a virtual keyboard has painted her fingernails with dark nail polish, but the polish chipped off her right little finger nail. Because it is brighter, the bare nail on the right little finger will reflect more light than an adjacent finger nail covered with the dark polish. To a luminance-based sensor system, the reflective little finger would be detected as being closer to the sensor than the adjacent finger, which is less reflective. Thus, if the typist touched "l" and ";", the luminance-based detector would tend to read the ";" character as the letter "p", e.g., the nearest keyboard character that is a shorter distance to the sensor, since the brighter signal from the bare fingernail would be falsely interpreted as being closer to the sensor.

It is important to appreciate that DuFaux relies upon reflective luminance data to detect "a reflected light pattern representing the position of the plurality of objects within the input zone"; see DuFaux claim 1, lines 20-23. As defined by DuFaux at col. 5, line 35, "light pattern" is the combination of "position and intensity". The term "light pattern" appears throughout DuFaux's claims. Note too the following language from DuFaux, col. 5, lines 29-37:

> *The **position and intensity** of each reflected light ray 58 along the length of the light sensing device 52 **represents the position** of the "key" in the virtual image 80 that is depressed by the operator. **The intensity (strength) of the signal received by the light sensing device 52 represents the distance from the point of the reflection (i.e., the operator's fingers(s)).*** *(emphasis added)*

In short, DuFaux attempts to measure distance solely from reflected intensity data, e.g., data such as shown in his Fig. 6. But this is precisely the sort of confusion-prone system that was criticized at para. [0004] in applicants's Background of the Invention. It

is precisely this sort of intensity or luminescence-based distance finding system that the presently claimed invention avoids.

By contrast, applicants's presently claimed system is substantially different. Applicants's claim 73 definitely recites that detection of a contact point on the virtual input device involves two mechanisms, and includes:

> means for determining occurrence of an interaction between said object and said virtual transfer device;
> means for determining relative position of a portion of said user-object on said plane corresponding to a determined said occurrence of said interaction;

Support for these two mechanisms is found in the Specification, para. [0008]:

> As such, the dual tasks of detecting initial and continuing contact and penetration of plane 30 (e.g., touch events) and determining interaction coordinate positions on the plane may be thus accomplished.

Further, consider the following language from the bottom of para. [0049] in the Specification:

> The present invention localizes interaction between a user finger or stylus and a passive touch surface (e.g., virtual input device), defined above a work surface, using planar quasi-three-dimensional sensing. ... Once a touch has been detected, the invention localizes the touch region to determine where on a virtual input device the touching occurred, and what data or command keystroke, corresponding to the localized region that was touched, is to be generated in response to the touch. ... In the various embodiments, triangulation analysis methods preferably are used to determine where user-object "contact" with the virtual input device occurs.

Applicants's thus first detect whether any object-interaction with the virtual transfer device has occurred by examining detected reflected optical energy from object penetration into the light plane that is "substantially

parallel-to and spaced-above a presumed location of said virtual transfer device". If such a "touching event" (Specification, para. [0032] is detected, then a mechanism preferably implementing triangulation is used to determine location of the touching on the plane of the virtual transfer device. As such, applicants do <u>not</u> use luminance data to determine distance, but rather to determine, "yes" or "no", was there a touching event between the object and the light plane. If "yes", then a separate mechanism is employed to determine where, e.g., what virtual key or what virtual track position", touching occurred. It will be appreciated that applicants's triangulation or other technique to determine where touching occurred does <u>not</u> rely upon brightness of the object. Thus, whereas DuFaux must rely upon object brightness to try to determine touch position, the present invention determines touch position independently of brightness (or reflectivity) of the object. In DuFaux, if brightness of a finger object suddenly increased by say 30%, DuFaux would report distances that were falsely too short. But in the presently claimed invention, a change in brightness of an object does not alter distance determinations, as appicants' triangulation is not based upon luminance data.

The presently claimed invention further differs from DuFaux in defining a light plane "substantially parallel-to and spaced-above a presumed location of said virtual transfer device", e.g., claim 73.

Applicants wish to point out that at para. 1, page 2 of the Office Action, the Examiner has misinterpreted the orientation relationship between DuFaux sheet of light 48 (Fig. 2) and the plane of the virtual input device. The Examiner cites DuFaux's plan view Fig. 2 as supporting the conclusion that what is defined is "a plane substantially parallel-to and spaced-above a presumed location of said virtual device". The Examiner also cites

DuFaux col. 3, lines 66, spanning col. 4, line 42. But neither DuFaux's Fig. 2 nor the cited language support the Examiner's conclusion that there is a parallel relationship between DuFaux's sheet of light relative to the virtual device. Quite the contrary, DuFaux's side view Fig. 10 and side view Fig. 11 clearly show that the plane of light emanating from DuFaux's device is <u>not</u> parallel to the plane but slopes <u>downward</u> to illuminate and to intersect the plane. (Please note the downward slope of the phantom lines exiting DuFaux's device.) DuFaux's Fig 8 is in accord, and shows the light source disposed <u>above</u> the sensor such that to illuminate user fingers near the table surface, the light source <u>must</u> slope downwards ... otherwise there would be no illumination.

In view of the above comments, applicants submit that DuFaux fails to disclose or suggest every element recited in amended claim 73, and as such does not anticipate claim 73, nor any of claims 75-79, and 83-86. In short, claims 73, 75-79, and 83-86 are not anticipated by DuFaux.

REJECTIONS UNDER 35 USC §103(a):

At ¶2 of the pending Office Action, claims 74, 80, and 81 were rejected under 35 USC §103(a) as being unpatentable over DuFaux '252 in view of USP 6,281,878 to Montellese. The Examiner states that while DuFaux does not disclose determining relative position using triangulation, Montellese does.

Applicants first note that if DuFaux's luminance-based system actually worked as asserted by DuFaux, there would be no need to add triangulation, because DuFaux's system would already be completely self-contained. As such, there is no motivation to seek out triangulation mechanisms.

But as applicants will now demonstrate, Montellese's triangulation is inapplicable to a DuFaux type system involving interaction between a user-controlled object and a virtual

input device, e.g., a virtual keyboard. Montellese's triangulation cannot determine if and when a finger (or object) has contacted (or penetrated) the plane of the virtual input device.

These deficiencies exist because Montellese's light beam is either parallel or tilted relative to the plane of the virtual input device. If the light beam is parallel, e.g., slope equal to zero, Montellese cannot determine any depth information from the image position of the fingers.

As Montellese himself concedes at col. 6, lines 42-46: "The slope of the plane of light and the resolution of the sensor will effect [sic] the sensitivity of the input device 10. Of course, if the slope of the plane of light illustrated in Montellese Fig. 9 is inverted, the depth perception of the sensor will be reversed."

One can draw two conclusions from Montellese's admissions. First, with a slope of zero the sensitivity is zero, and no depth information can be determined. Second, a rather substantial slope would be necessary to obtain sufficient depth resolution with an ordinary camera sensor.

Montellese does not disclose what amount of slope would be necessary. However a simple calculation with reference to Montellese Fig. 9 shows that the difference between the beam heights d1 and d2 must be at least a centimeter to yield sufficient accuracy to determine which key of a standard keyboard is being contacted. This statement assumes that the camera parameters are such as to allow the view of an entire keyboard at a distance of about 10 cm to 30 cm, and that a camera with good resolution is used.

As a result, no image of the user's finger will appear when the finger touches the surface at at least one end of the virtual keyboard. Instead, the image of the finger will appear when the finger penetrates the light beam, a distance of at least one centimeter above the surface of the virtual input keyboard device. But in actual use, several user fingers typically hover in proximity to the plane of the virtual keyboard. Unfortunately, all

such fingers, even fingers not in "contact" with the virtual keyboard will cause Montellese's method to report keystrokes. Montellese cannot determine when a touching event has occurred because in proximity to his sensor system, the light beam is substantially above the table surface. The result is no illumination for regions of a user finger in close proximity to the table.

In summary, Motellese describes an impractical system that could not reliably, if at all, determine which user finger contacted which key when in time on the virtual keyboard. As such, Montellese's triangulation appears unworkable with Montellese's own invention, and would add nothing to DuFaux's luminance-based system with its downwardly sloping plane of light. In essence, the best Montellese can provide is triangulation to determine position of an object with respect to a reference plane that is not necessarily the plane of the virtual input device; see Montellese col. 9, lines 1-2. By contrast, the presently claimed invention functions well enough to be a commercially viable product. Celluon, Inc., licensee of assignee Canesta, Inc. sells the presently claimed invention world-wide. As noted at Celluon's website, www.celluon.com, the presently claimed invention has won numerous awards, including "Best Product: Peripheral Category" at the Retail Vision Spring Event, April 2006, San Antonio, Texas.

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In view of the above, applicants submit that pending claims 73-86 are allowable over DuFaux and/or Montellese, and should be passed to allowance at this time.

Reconsideration of this application is respectfully requested. As demonstrated herein, the presently claimed invention is patentable over the art of record. Applicants request that the Examiner reconsider and withdraw his outstanding rejections. Pending claims 73-86 should be passed to allowance at this time.

CONCLUSION

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot, and, hopefully, the confusion regarding the status and numbering of the claims has now been attended to. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided below.

Prompt and favorable consideration of this Amendment and Response is respectfully requested.

Respectfully submitted,

CANESTA, INC.

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Michael A. Kaufman

Michael A. Kaufman, Esq.
Reg. No. 32,98

CANESTA, INC.
440 No. Wolfe Road, Ste. 101
Sunnyvale, CA 94085
Telephone: 408-524-1457
FAX: 408-530-1527